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SHORTER ARTICLES AND DISCUSSION

EVOLUTION WITHOUT ISOLATION

THIS is the title of a brief but interesting article by O. F. Cook, in the AMERICAN NATURALIST for November, 1908. My response to the same has been delayed by the pressure of other things.

I fully agree with Dr. Cook in his statement that "The choice of words is worthy of careful consideration, but words should not lead us away from the broader issue of biological facts."

We both maintain that there may be evolution without isolation; but I do not see how he can reconcile the following statements, found in the above mentioned article, with the facts of nature. "The separation of a species into two or more parts allows the parts to become different, but there is every reason to believe that evolutionary changes of the same kind would take place, if the species were not divided." Again: "*Isolation*, though making more species, *impedes evolution*." Does he mean that if man and the anthropoid apes had remained one freely intergenerating species, a higher degree of intelligence would have been reached than has been attained by man under the condition of isolation between him and the apes? Does he mean that the progress of the mammals, as a whole, would have been more rapid, if they had remained one constantly intergenerating species? Does he mean that, in the case of mammals, "changes of the same kind," as we now see, in size, in form, in instincts, in power to live, some in the sea like the whales and the porpoises, some on the land, some on the trees, some in hand-made houses, would all have taken place, if we, the mammals, had remained one species? Would these changes have come in successive generations, in one continuously changing kaleidoscope; or would each successive generation have become increasingly complex, till the mouse could produce, not only mice, but all other mammalian forms, including the cat, the flying-squirrel and the whale?

In many places in my volume on "Evolution," published by the Carnegie Institution, I speak of isolation and selection as *controlling factors*, while growth, reproduction, heredity and

variation are classed as fundamental conditions in evolution. Some of these passages will be found on pages 29-34, 59-60, 79-80, 138. I also show that the forms of isolation and selection, that divide and guide the process of evolution, are often determined by relations between sections of the species, and may therefore be classed as autonomic. See pp. 138-39, 141-44 and 158. These autonomic forms of isolation and selection come under what Dr. Cook defines as processes of evolution, that is "processes of spontaneous change," as does also the process of reproduction with variation. If autonomic processes of isolation and selection are forms of evolution, shall we claim that natural selection, because it relates to the power of individuals and groups to meet influences in the environment, has, therefore, nothing to do with evolution, except as it retards evolution? If the power to assimilate good and abundant food helps in the process of evolution, may not the survival of those having this power in the fullest measure help in the same process? How then can Dr. Cook say, as on the second page of his article, that isolation and selection neither cause evolution, nor help it along? I can suppose that his answer might be, that, in as far as these factors have influence, the changes produced cease to be spontaneous, and, therefore cease to be evolution, as he understands evolution. But this explanation does not seem to be applicable to cases of transformation arising under isolation and selection caused by autonomic influences, for example by sexual and social instincts.

There are, it seems to me, many difficulties in the way of regarding the term evolution as applicable only to "spontaneous processes of change," unless we class all vital action, including variation and the survival of the fittest, as spontaneous, in that it arises from within, and its origin is life producing life from itself, and never life springing out of the dead environment, or out of widely different forms of life. And then we should have to meet the objection that all life is dependent on external conditions for its food, and, therefore, for continued existence, and so no vital action is spontaneous in the sense that it is independent of conditions in the environment.

Let us suppose that a little snail, clinging to a leaf is carried by a bird, from the home of the species in a valley on this island of Oahu, and dropped in an adjoining valley half a mile away, where the conditions of soil, vegetation, rainfall and tempera-

ture are the same as in the home valley. It finds a grove of the same kind of trees as that from which it came, and from its young arises a permanent colony. At the end of a few scores of years, what do we find? It has blossomed out in a new group of variations not found in the original stock, and some of the original characters have disappeared. Here is what seems to be "*a spontaneous process of change*"; and we are about to call it a genuine case of evolution, when Dr. Cook reminds us that, if this change could not have taken place without isolation, it is not spontaneous, and that it is really a case of the impeding of evolution.

In the course of time another branch colony is formed, which varies from the original stock in habits of feeding and seeking of shelter from the sun. It gradually, but spontaneously, takes to the shrubbery near the ground, and deserts the trees; and so subjects itself to a new form of selection. The change is greater than in the former case, and is undoubtedly due to spontaneous variation, with survival of the fittest under new conditions chosen for itself spontaneously; for the kind of trees, on which the original stock lived, are found in abundance all around. Shall we call the process a case of evolution, or simply the checking of evolution through isolation and selection? I am inclined to define evolution so as to include the processes of change in such cases as these.

In this same article we find statements giving still greater limitation to what the author considers the real process of evolution. In the last paragraph it is called, "The processes of spontaneous, progressive change in species." On the third page also, we read: "Divergence may be greater than evolution when changes are not progressive, but sideways, or backwards." If the change in a species must be shown to be entirely spontaneous, and also not sideways or backwards, but upward, before we can venture to speak of it as an example of evolution, this word, now so popular, will find itself badly ostracized. "Speciation" is introduced as a rival for part of the field; but I am not sure that it will show itself better fitted than the term *divergent evolution*. I am, however, willing that the fate of the two should be left to the struggle for existence, and the success of the fittest, which I regard as one of the controlling factors in the evolution of language. The statement I am unwilling to accept is that isolation and the survival of the fittest (that is species-forma-

tion), have no connection with evolution except that they may impede the process. If all organisms came from one original intergenerating stock, deriving its food from the inorganic world, and from the dead individuals of its own kind, how far could evolution have progressed without any formation of separate species? What would now become of the organic world if isolation and selection ceased and all the separate species were merged in one? When I say that there may be evolution without isolation I mean without *additional isolation*. I do not mean that the undoing of all the effects produced by vital forces making isolation complete, though the different genera occupy the same district, would be an advance step in evolution. On the contrary, I think that such an undoing would mean the crumbling of the whole fabric of the organic world.

Is not racial evolution a term that we can rightly and wisely apply to all the processes of change in organisms affecting characters that are subject to the laws of heredity and variation? May it not be applied to all changes in races and species resulting, not only from the action and reaction of members of the same species upon each other, but also from the action and reaction between individuals or groups and their environments? May not evolution be either divergent, convergent or parallel? either progressive, or retrogressive? May it not take place without any change in the environment, and in that sense be spontaneous; and may it not be due to vital action stimulated, guided, and controlled by external conditions?

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RETROACTIVE SELECTION¹

IN his contribution to THE AMERICAN NATURALIST of July, Professor Marshall makes some statements which I wish to correct. Among other things he says:

¹ "Retroactive Selection" is a term used by me to designate the modifications of each selection by the selections which follow. Thus, selection No. 2 modifies selection No. 1 by eliminating part of the animals which selection No. 1 retained as breeders. Selection No. 3 modifies selection No. 2 by eliminating some of the animals which selection No. 2 retained, and this in turn causes a second modification in selection No. 1 by eliminating more of those originally retained. In the same way, selection No. 4 modifies selections Nos. 1, 2 and 3; selection No. 5 modifies selections Nos. 1, 2, 3 and 4; and so on.

A study of retroactive selection is a study of the successive modifications of early selections by the retroactive effect of later ones.